

EPIDEMIOLOGY OF ACETABULUM FRACTURES TREATED AT THE INSTITUTO NACIONAL DE TRAUMATOLOGIA E ORTOPEDIA (INTO)

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ABSTRACT

Objectives: The purpose of this study was to review the epidemiological aspects of displacement fractures of the acetabulum that had been treated surgically at the National Institute of Traumatology and Orthopedics (INTO). **Methods:** We retrospectively analyzed 126 acetabulum fractures that had been treated surgically at INTO between March 2006 and November 2008. The following factors were taken into account: age, sex, trauma mechanism, injury classification, time elapsed between trauma and surgery, affected side and associated bone injuries. **Results:** 76.8% were male; the mean

age was 39.6 years. The trauma mechanism was traffic accidents in 59%; the time that elapsed between injury and surgery was on average 16.4 days; 55% of the cases were on the right side; 30% of the patients presented associated fractures. **Conclusion:** Most of the patients were male, in an economically active age group, and were victims of traffic accidents. Edge and/or posterior column fractures were the most frequent types. Associated injuries were common and most of the fractures operated in our service came to us late.

Keywords – Acetabulum/surgery; Fractures, Bone; Epidemiology; Wounds and Injuries

INTRODUCTION

Over the last 40 years, treatments for displaced fractures of the acetabulum have gone from non-surgical to a preferentially surgical approach. Through the contribution made by Letournel(1), open anatomical reduction followed by rigid internal fixation became regarded as the gold standard for treating displaced fractures of the acetabulum.

Before the advent of automobiles and motorcycles in modern life, this type of injury was essentially caused by lower-limb adduction or abduction forces at different degrees of intensity, in association with some internally or externally rotated flexion. Today, high-kinetic energy

trauma that is usually traffic-related predominates as the etiology⁽²⁾.

Around two thirds of the patients are young and associated injuries are commonly found in this group, at rates ranging from 40% to 75%⁽³⁾.

The importance of early recognition of this group of fractures, and establishing the definitive treatment as quickly as possible, are frequently emphasized in the literature. In order to optimize the treatment for these injuries, the nature of the fracture needs to be understood. To this end, it is recommended to use classification methods that indicate the prognosis and treatment⁽⁴⁾.

Also in this respect, the time that elapses between

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the injury and the institution of definitive treatment is considered to be of prime important for obtaining an anatomical reduction. This aim becomes more difficult as the treatment becomes postponed, and such delays consequently end up influencing the functional result for these patients⁽⁵⁾. In view of the constant evolution in the approach taken towards these injuries, and the morbidity associated with such injuries, which is frequently a topic for discussion, we were motivated to study the characteristics of this group of fractures.

The purpose of the present study was to review the epidemiological aspects of displaced fractures of the acetabulum that were treated surgically at the National Institute of Traumatology and Orthopedics (INTO), and to compare our results with findings in the literature.

METHODOLOGY

A retrospective analysis was conducted on 126 fractures of the acetabulum that were treated surgically by physicians at the Pelvis and Acetabulum Center of INTO, between March 2006 and November 2008. The survey was carried out by means of active searches in the INTO databases, using the International Classification of Diseases (ICD) code S324, which corresponds to fractures of the acetabulum. From the patient registration numbers in INTO, the respective patients' medical files and image files were then consulted. The inclusion criteria were that these should be patients who underwent surgical treatment for fractures of the acetabulum, independent of whether there were any associated injuries; both sexes and all ages were included; and outpatient follow-up continued until February 2009. The following were excluded: patients treated using non-surgical methods, those who were lost from the outpatient follow-up and those whose medical files and/or imaging examinations presented deficiencies among the data taken into account in this study. The following factors were taken into consideration: age; sex; trauma mechanism; injury classification according to Tile⁽⁶⁾, as assessed by three surgeons who were familiar with treating fractures of the acetabulum, after analysis on anteroposterior radiographs of the pelvis, ala and obturator and tomography with slices of 1.8 mm and reconstruction in three planes (coronal, axial and sagittal); time elapsed between the trauma and the surgical treatment; side affected; and associated bone lesions. The results were evaluated using means and standard deviations.

Out of the 126 patients analyzed, 53 were excluded

from the analysis: seven because non-surgical methods were used as the treatment of choice; nine because of loss from the follow-up; and 37 because the information in the medical files and/or imaging examinations was incomplete with regard to the points taken into consideration in the present study. These exclusions were in relation to failure to obtain information regarding the length of evolution of the fracture at the time of the surgical treatment and in relation to the trauma mechanism for the injury. We believe that although a substantial proportion of our sample was excluded, this did not give rise to any significant changes in the epidemiological profile of our study, given that injuries that were no longer fresh predominated. This is a general characteristic at our institution and of traffic accidents as the trauma mechanism. Out of the 126 cases initially assessed, only 73 were actually included in the analysis.

The present study was conducted in conformity with the Declaration of Helsinki, of the World Medical Association.

RESULTS

Among the 73 patients, 56 (76.8%) were male and 17 (23.2%) were female (Table 1). The mean age was 39.6 ± 3.8 years (minimum of 12 and maximum of 89 years) (Table 2). Regarding the trauma mechanism, 43 cases (59%) were due to vehicle accidents, 14 (19%) were due to accidents involving motorcycles, six (8.2%) involved pedestrians who were run over, nine (12.4%) were due to falls, and one (1.4%) occurred on a ship (Table 3). According to the Tile classification⁽⁶⁾: 20 cases (27.4%) could be classified as A1, seven (9.6%) as A2, two (2.7%) as A3, 25 (34.4%) as B1, six (8.2%) as B2, 11 (15%) as C1, two (2.7%) as C2, and none as either B3 or C3. There was no disagreement between the observers in any of the cases regarding the type of fracture (Table 4). The time that elapsed between the injury and the surgical treatment was a mean of 16.4 ± 1.1 days (minimum of one and maximum of 64 days) (Table 5). Forty cases (55%) were on the right side and 33 (45%) were on the left side (Table 6). Twenty-two patients (30%) presented associated fractures, among which there were eight cases (36.3%) of lesions of the

Table 1 – Distribution according to sex.

| | Male | Female |
|-------|------|--------|
| Cases | 56 | 17 |
| % | 76.8 | 23.2 |

Table 2 – Distribution according to age (in years).

| Age | Minimum | Maximum | Mean \pm standard deviation |
|-------|---------|---------|-------------------------------|
| Years | 12 | 89 | 39.6 \pm 3.8 |

Table 3 – Trauma mechanism.

| Mechanism | Automobile | Motorcycle | Run over | Fall | Ship |
|-----------|------------|------------|----------|------|------|
| Cases | 43 | 14 | 6 | 9 | 1 |
| % | 59 | 19 | 8.2 | 12.4 | 1.4 |

pelvic ring, five (22.5%) of the femur, four (17.2%) of the tibia, two (9%) of the wrist, one (5%) of the patella, one (5%) of the clavicle, and one (5%) of the pelvic ring, femur and tibia (Table 7).

DISCUSSION

Letournel⁽¹⁾ revolutionized the treatment of fractures of the acetabulum through developing better comprehension of this type of injury and rationalizing the surgical approach. Starting from these concepts, many surgeons were encouraged to treat these injuries surgically and, since then, many studies on surgical treatment of acetabular lesions have been published.

In an extensive review published in 2005, Giannoudis *et al*⁽⁷⁾ analyzed 160 studies on displaced fractures of

the acetabulum. Of these, only 34 fulfilled their rigorous inclusion criteria, thus giving a total of 3,670 cases of displaced fractures in 3,669 patients.

Regarding sex, Giannoudis *et al*⁽⁷⁾ found that 69.4% of the patients were male. Their finding was corroborated by our sample, in which the great majority were male (76.8%). Their mean age was 38.6 \pm 4.6 years and ours was 39.6 \pm 3.8 years, which highlights the fact that the greatest prevalence was among the young and economically active population. Traffic accidents were responsible for 80.5% of the cases analyzed by Giannoudis *et al*⁽⁷⁾. In our sample, traffic accidents accounted for 78% of the cases. Giannoudis *et al*⁽⁷⁾ used the Letournel classification⁽¹⁾ for analysis purposes. This system is used in most published papers. For our cases, we used the Tile classification⁽⁶⁾ because this is the one chosen in our service. Nevertheless, this difference in classification system did not stop us from making comparisons between the results. In the study by Giannoudis *et al*⁽⁷⁾, the highest incidence was of fractures of the posterior column (23.9%), followed by fractures of both columns (22%). Our results showed that the edge and/or posterior column was affected most frequently, totaling 37%. Unlike in the study by Giannoudis *et al*⁽⁷⁾, fracturing of both columns was found in only 13.7% of the cases. Matos *et al*⁽⁸⁾ evaluated the reproducibility of the Tile classification⁽⁶⁾ and recommended it for use in clinical practice, which ratifies the use of this classification in our service. On the other hand, Sancineto *et al*⁽⁹⁾ found low inter and intra-person reproducibility with the Letournel classification⁽¹⁾. The mean time that elapsed between the injury and the surgery was 8.9 \pm 2.9 days in the study by Giannoudis *et al*⁽⁷⁾. Contrary to this, in our experience, lesions that were no longer fresh prevailed in our experience, with a mean of 16.4 \pm 1.1 days. Matta *et al*⁽³⁾ reported that fractures that had evolved for 14 or more days presented compromised quality of reduction because of surgical difficulties, and they therefore considered such fractures to be old. Within our setting, Köberle *et al*⁽¹⁰⁾ obtained results ranging from zero to 150 days, such that 25 cases were operated before reaching three weeks of evolution and 17 after this time point, out of a total of 42 cases. This partially reflects the difficulty in access to treatment for such

Table 4 – Distribution according to Tile classification⁽⁶⁾.

| Type | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 |
|-------|------|-----|-----|------|-----|-----|----|-----|-----|
| Cases | 20 | 7 | 2 | 25 | 6 | XXX | 11 | 2 | XXX |
| % | 27.4 | 9.6 | 2.7 | 34.4 | 8.2 | XXX | 15 | 2.7 | XXX |

Table 5 – Time interval between the fracturing and the surgical treatment.

| Time elapsed (days) | Minimum | Maximum | Mean \pm standard deviation |
|---------------------|---------|---------|-------------------------------|
| Cases | 1 | 64 | 16.4 \pm 1.1 |

Table 6 – Side affected.

| Side affected | Left | Right |
|---------------|------|-------|
| Cases | 33 | 40 |
| % | 45 | 55 |

Table 7 – Associated bone lesions.

| Associated lesions | Pelvis | Femur | Tibia | Wrist | Patella | Clavicle | Pelvis/ femur/ tibia | Total |
|--------------------|--------|-------|-------|-------|---------|----------|----------------------|-------|
| Cases | 8 | 5 | 4 | 2 | 1 | 1 | 1 | 22 |
| % | 36.3 | 22.5 | 17.2 | 9 | 5 | 5 | 5 | 100 |

injuries within our setting. Regarding the side affected, the right side was injured more frequently than the left side: 55% to 45%, respectively. The inverse was found by Knop *et al*⁽¹¹⁾. These authors published a sample of 40 cases in which 16 (40%) were on the right side, 22 (55%) were on the left side and two (5%) were bilateral. Giannoudis *et al*⁽⁷⁾ did not take this information into account in their meta-analysis and other studies did not mention the side⁽¹²⁻¹⁴⁾, which makes us suppose that this information was omitted because it did not have any great repercussion from the point of view of treatment and prognosis.

Associated lesions in patients with acetabular fractures have been plentifully documented, and limb fractures and cranial-encephalic trauma are the commonest^(10,12-14). Other associated fractures occurred in 45% of the cases according to Giannoudis *et al*⁽⁷⁾, whereas 30% had such associations in our sample. Also contrasting with our results, these authors found that limb fractures predominated over fractures of the pelvic ring, i.e. the inverse of our findings. They were unable to explain their difference in frequency. Because our service does not have an open emergency service and is exclusively an orthopedic hospital, we did not take into consideration lesions associated with systems other than the musculoskeletal system, because of the profile of our institution and the patients that it attends.

Thus, the present study draws attention to the fact that although our institution has a center dedicated exclusively to fractures of the pelvic ring and acetabulum, we nonetheless have difficulty in proceeding with surgical

treatment within the recommended ideal time period⁽³⁾. This reflects the difficulties that the local healthcare system has in providing the initial attendance, immediately recognizing the surgical nature of the injury and contacting the central regulator with a view to enabling prompt transfer of such patients to a specialized center. This delay in implementing the appropriate definitive treatment is naturally reflected in the clinical and radiological results for this group of patients^(3,5,7).

The clinical repercussions from these injuries are outside of the scope of this paper. However, through the stimulation of this study, we intend to correlate our epidemiological findings with the therapeutic approach implemented and its functional repercussion among patients undergoing osteosynthesis on acetabular fractures at our institution, in a future study.

CONCLUSIONS

The majority of the patients were male, in the economically active age group, and were victims of traffic accidents. The edge and/or posterior column were affected in most of the cases, in agreement with the literature.

Associated lesions occurred frequently and most of the fractures operated in our service, in contrast with the literature, were old.

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